SECTION 15250

MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. Requirements of the following Division 15 Sections apply to this section:

1. "Basic Mechanical Requirements."

2. "Basic Mechanical Materials and Methods."

1.2 SUMMARY

A. Extent of mechanical insulation required by this section is indicated on drawings and schedules, and by requirements of this section.

B. Types of mechanical insulation specified in this section include the following:

1. Piping System Insulation:

a. Fiberglass

b. Cellular Glass

c. Calcium Silicate

d. Flexible Unicellular

2. Ductwork System Insulation:

a. Fiberglass.

3. Equipment Insulation:

a. Fiberglass.

b. Calcium Silicate

c. Flexible Unicellular.

C. Related Sections: The following Sections contain requirements that relate to this Section.

1. Division 15 section "Supports and Anchors" for protection saddles, protection shields, and thermal hanger shields; not work of this section.

2. Division 15 section "Metal Ductwork" for duct linings; not work of this section.

3. Division 15 section "Mechanical Identification" for installation of identification devices for piping, ductwork, and equipment; not work of this section.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.

1.4 QUALITY ASSURANCE

A. Installer's Qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.

B. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastic and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.

B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Armstrong World Industries, Inc.

2. Babcock & Wilcox; Insulating Products Div.

3. CertainTeed Corp.

4. Knauf Fiber Glass GmbH.

5. Manville Products Corp.

6. Owens-Corning Fiberglass Corp.

7. Pittsburgh Corning Corp.

8. Rubatex Corp.

2.2 PIPING INSULATION MATERIALS

A. Fiberglass Piping Insulation: ASTM C 547, Class 1 unless otherwise indicated.

B. Calcium Silicate Piping Insulation: ASTM C 533, Type I.

C. Cellular Glass Piping Insulation: ASTM C 552, Type II, Class 2.

D. Flexible Unicellular Piping Insulation: ASTM C 534, Type I.

E. Jackets for Piping Insulation: ASTM C 921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at Installers option.

1. Encase fiberglass and calcium silicate pipe fittings insulation with one-piece premolded PVC fitting covers, fastened as per manufacturer's recommendations.

2. Encase exterior piping insulation with aluminum jacket with weather-proof construction.

F. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.

G. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

2.3 DUCTWORK INSULATION MATERIALS

A. Rigid Fiberglass Ductwork Insulation: ASTM C 612, Class 1.

B. Flexible Fiberglass Ductwork Insulation: ASTM C 553, Type I, Class B-4.

C. Flexible Unicellular Ductwork Insulation: ASTM C 534, Type II.

D. Jackets for Ductwork Insulation: ASTM C 921, Type I for ductwork with temperatures below ambient; Type II for ductwork with temperatures above ambient.

E. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.

F. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers,

protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

2.4 EQUIPMENT INSULATION MATERIALS

A. Rigid Fiberglass Equipment Insulation: ASTM C 612, Class 2.

B. Flexible Fiberglass Equipment Insulation: ASTM C 553, Type I, Class B-4.

C. Calcium Silicate Equipment Insulation: ASTM C 533, Type I, Block.

D. Flexible Unicellular Equipment Insulation: ASTM C 534, Type II.

E. Jacketing Material for Equipment Insulation: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, or aluminum jacket at Installer's option, except as otherwise indicated.

F. Equipment Insulation Compounds: Provide adhesives, cements, sealers, mastic and protective finishes as recommended by insulation manufacturer for applications indicated.

G. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 PLUMBING PIPING SYSTEM INSULATION

A. Insulation Omitted: Omit insulation on chrome-plated exposed piping (except for handicapped fixtures), air chambers, unions, drain lines from water coolers, drainage piping located in crawl spaces or tunnels, buried piping, fire protection piping, and pre-insulated equipment.

B. Cold Piping Application Requirements: Insulate the following cold plumbing piping systems:

1. Interior above-ground potable cold water piping.

2. Interior above-ground storm water piping (Rain water leaders).

C. Insulate each piping system specified above with one of the following types and thicknesses of insulation:

1. Fiberglass: 1/2 inch thickness.

2. Flexible Unicellular: 1/2 inch thickness, only for runouts in walls.

D. Hot Piping Application Requirements: Insulate the following hot plumbing piping systems:

1. Interior above-ground potable hot water piping.

2. Interior above-ground potable hot water recirculating piping.

3. Insulate each piping system specified above with one of the following types and thicknesses of insulation:

a. Fiberglass: 1 inch thick for pipe sizes up to and including 4 inch, 1-1/2 inch thick for pipe sizes over 4 inch

b. Flexible Unicellular: 1/2 inch thickness, only for runouts in walls.

E. Cold Piping Underground Application Requirements: Insulate the following cold plumbing piping systems:

1. Below-ground potable cold water piping.

2. Insulate each piping system specified above with:

a. Cellular Glass: 1/2 inch thickness

F. Hot Piping Underground Application Requirements: Insulate the following hot plumbing piping systems:

1. Below-ground potable hot water piping.

2. Below-ground potable hot water recirculating piping.

3. Insulate each piping system specified above with:

a. Cellular Glass: 1/2 inch thickness.

3.3 HVAC PIPING SYSTEM INSULATION

A. Insulation Omitted: Omit insulation on hot piping within radiation enclosures or unit cabinets; on cold piping within unit cabinets provided piping is located over drain pan; on unions, flexible connections, and expansion joints.

B. Sub-Freezing Piping (0 to 39 deg. F) Application Requirements: Insulate the following sub-freezing HVAC piping systems:

1. Refrigerant suction lines between evaporators and compressors. Brine refrigerant piping.

2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:

a. Fiberglass: 1 inch thick for pipe sizes up to and including 1 inch, 1-1/2 inch thick for pipe sizes over 1 inch.

b. Flexible Unicellular: 3/4 inch thick for pipe sizes up to and including 1-1/2 inch (largest size permitted).

C. Cold Piping (40 degree F to ambient) Application Requirements: Insulate the following cold HVAC piping systems:

1. HVAC make-up water piping.

2. Air conditioner condensate drain piping.

3. Insulate each piping system specified above with one of the following types and thicknesses of insulation:

a. Fiberglass: 1 inch thick for pipe sizes up to and including 6 inch, 1-1/2 inch thick for 8 inch and larger.

b. Fiberglass: 1 inch thickness, only for runouts in walls.

D. Dual Temperature Piping (40 deg. to 250 deg. F) Application Requirements: Insulate the following dual temperature HVAC piping systems:

1. Heat pump water supply and return piping.

2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:

a. Fiberglass: 1-1/2 inch thick for pipe sizes up to and including 2 inch, 2 inch thick for pipe sizes over 2-1/2 inch through 6 inch, 2-1/2 inch for 8 inch and larger.

b. Fiberglass: 1 inch thickness only for runouts in walls.

3.4 DUCTWORK SYSTEM INSULATION

A. Insulation Omitted: Do not insulate fibrous glass ductwork, or lined ductwork.

B. Cold Ductwork (Below Ambient Temperature) Application Requirements: Insulate the following cold ductwork:

1. Outdoor air intake ductwork between air entrance and fan inlet or HVAC unit inlet.

2. HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room terminal outlet.

3. HVAC return ductwork in mechanical equipment rooms.

4. HVAC plenums and unit housings not pre-insulated at factory or lined.

5. Insulate each ductwork system specified above with one of the following types and thicknesses of insulation:

a. Rigid Fiberglass: 1-1/2 inch thick, for exposed ductwork, etc.

b. Flexible Fiberglass: 1-1/2 inch thick, application limited to concealed locations.

C. Hot Ductwork (Above Ambient Temperature) Application Requirements: Insulate the following hot ductwork:

1. Hot supply ductwork between fan discharge, or heating unit discharge, and room terminal outlet.

2. Heating plenums and unit housings not pre-insulated at factory or lined.

3. Insulate each ductwork system specified above with one of the following types and thicknesses of insulation:

a. Rigid Fiberglass: 1-1/2 inch thick, for exposed ductwork, etc.

b. Flexible Fiberglass: 1-1/2 inch thick, application limited to concealed locations.

3.5 EQUIPMENT INSULATION

A. Cold Equipment (Below Ambient Temperature) Application Requirements: Insulate the following cold equipment:

1. Refrigeration equipment, including pumps.

2. Drip pans under chilled equipment.

3. Cold water pumps.

4. Roof drain bodies.

5. Insulate each item of equipment specified above with one of the following types and thicknesses of insulation:

a. Fiberglass: 1 inch thick for surfaces above 40 deg. F (2 deg. C) and 1-1/2 inch thick for surfaces 40 deg. F (2 deg. C) and lower.

b. Flexible Unicellular: 1 inch thick.

B. Hot Equipment (Above Ambient Temperature) Application Requirements: Insulate the following hot equipment:

1. Water heaters (not pre-insulated at factory).

2. Insulate each item of equipment specified above with one of the following types and thicknesses of insulation:

a. Fiberglass: 2 inch thick.

b. Calcium Silicate: 3 inch thick.

3. Breeching and Stacks Application Requirements: Insulate the following breechings and stacks:

a. Breechings between heating equipment outlet and stack or chimney connection, except for double wall or factory insulated breechings.

b. Stacks from bottom to top except for factory insulated stacks.

c. Insulate each breeching and stack specified above with the following thicknesses of insulation:

i. Calcium Silicate: 3 inch thick.

3.6 INSTALLATION OF PIPING INSULATION

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance of tests.

C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

D. Clean and dry pipe surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

E. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.

F. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.

G. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

H. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3 inch wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3 inch wide vapor barrier tape or band.

3.7 INSTALLATION OF DUCTWORK INSULATION

A. General: Install insulation products in accordance with manufacturer's written

instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation materials with smooth and even surfaces.

C. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

D. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.

E. Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where otherwise indicated.

F. Lined Ductwork: Except as otherwise indicated, omit insulation on ductwork where internal insulation or sound absorbing linings have been installed.

G. Corner Angles: Install corner angles on external corners of insulation on ductwork in exposed finished spaces before covering with jacketing.

3.8 INSTALLATION OF EQUIPMENT INSULATION

A. General: Install equipment thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.

B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gaping joints and excessive voids resulting from poor workmanship.

C. Maintain integrity of vapor-barrier on equipment insulation and protect it to prevent puncture and other damage.

D. Do not apply insulation to equipment, breechings, or stacks while hot.

E. Apply insulation using staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.

F. Coat insulated surfaces with layer of insulating cement, trawled in workmanlike manner, leaving smooth continuous surface. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.

G. Cover insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2 inch. Apply over vapor barrier where applicable.

H. Do not insulate boiler manholes, handholes, cleanouts, ASME stamp, and manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.

I. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames, accessories and pumps.

3.9 OUTDOOR INSULATION FINISH

A. General: Piping, ductwork and equipment exposed to weather shall have insulation protective finish or jacketing installed as recommended by manufacturer.

B. Piping: Pipe shall have aluminum jacket with moisture barrier with locking longitudinal seam and butt straps. Fittings, valves, flanges, etc. shall have factory or job fabricated aluminum cover secured with banding and/or screws.

C. Round ductwork: Same finish as piping.

D. Rectangular ductwork and equipment: Shall have white vinyl acrylic mastic applied in two coats and reinforced with glass cloth membrane.

3.10 EXISTING INSULATION REPAIR

A. Repair damaged sections of existing mechanical insulation, both previously damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.

3.11 PROTECTION

A. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 15250